

**INFLUENCE OF BIG DATA ANALYTICS IN ENHANCING COLLABORATION
AND TEAM LEADERSHIP MANAGEMENT IN BENUE STATE UNIVERSITY
LIBRARY, MAKURDI**

By

AONDONGU TARHULE

NGUSEER DOREEN INDYER

VERSHIMAREUBEN NDA

And

VERSHIMAMARTINS TOLOUGH

Abstract

This study investigates the influence of big data analytics on collaboration and team leadership management within Benue State University Library, Makurdi. The primary objectives are to assess the impact of predictive analytics, user behaviour analytics, and workflow analytics on enhancing collaboration and leadership, as well as to identify the challenges faced in leveraging big data analytics effectively. Employing a mixed-methods design, data was collected from a population of library staff using a structured questionnaire and semi-structured interviews. A purposive sampling technique was employed, resulting in a sample size of 104 respondents who constituted the population of the study. Quantitative data was analysed using descriptive statistics of frequency counts and mean. The findings reveal that predictive, user behaviour and workflow analytics significantly enhance collaboration and team leadership management. Conversely, limited technical infrastructure, privacy concerns, lack of data literacy, financial constraints and organizational resistance were some of the challenges encountered by library staff in leveraging big data analytics for enhanced collaboration and team leadership management. In conclusion, while big data analytics presents opportunities for improved collaboration and leadership, significant barriers must be addressed. Recommendations include investing in advanced analytics tools, expanding user behaviour analytics, optimizing workflow processes and implementing strategies to overcome identified challenges.

Keywords: Big Data Analytics, Collaboration, Team Leadership, University Libraries, Predictive Analytics, User Behaviour Analytics, Workflow Analytics.

Introduction

In today's digital age, the rapid expansion of data has transformed how organizations operate and make decisions, and libraries are no exception. The emergence of big data analytics, defined as the application of advanced analytic techniques to large and complex datasets, offers an unprecedented opportunity for libraries to leverage data-driven insights to improve operational efficiency, enhance collaboration and support effective team leadership.

As academic libraries increasingly serve as knowledge hubs, the integration of such analytics could be vital in advancing their capacity for data-driven collaboration and team leadership management.

Collaboration and team leadership are fundamental to organizational success, particularly within environments such as academic libraries, where teamwork is essential to meet user needs and support institutional goals. Collaboration is defined as the process in which individuals or teams work together towards shared goals by pooling resources, knowledge and skills. In a collaborative environment, team members contribute their expertise to collective tasks, allowing the organization to leverage a diverse range of skills and perspectives. Through collaboration, libraries can improve operational efficiency, share expertise across departments and develop comprehensive service offerings that meet the needs of their academic communities (Baker, 2017). Within libraries, collaboration is critical for coordinating tasks across different departments for enhanced team leadership which translates to efficient service delivery.

Team leadership is vital for fostering collaboration, as leaders play a central role in setting the team's direction, ensuring accountability and addressing conflicts or challenges as they arise. Team leadership involves guiding, motivating, and coordinating a team to achieve its goals effectively (Northouse, 2018). Team leaders also provide strategic oversight, aligning team efforts with organizational goals and facilitating a positive work environment that supports open communication and mutual. In the context of academic libraries, team leadership involves managing resources, coordinating staff activities and ensuring that all team members understand and work towards the library's mission. Effective collaboration and team leadership in academic libraries can be effective if big data analytics is effectively utilised for informed decision making.

Big data analytics is a set of techniques for analysing, processing and extracting insights from massive datasets which has emerged as a transformative tool in library management, enabling leaders to make data-driven decisions that enhance team collaboration and improve leadership strategies. Integrating big data analytics into management processes presents a promising opportunity to foster a collaborative, efficient and responsive library environment. According to Chen, Chiang and Storey (2012), big data analytics has a significant influence on both collaboration and team leadership by providing data-driven insights that inform decisions and improve team dynamics. Analytics tools like Apache Hadoop, Apache Spark, Tableau, IBM Watson Analytics, Microsoft Power BI, Pentaho, H2O.ai, Databricks, Alteryx among others can identify patterns in team performance, track workflow efficiencies and offer insights into user needs and preferences (Akter, Wamba, Gunasekaran, Dubey & Childe, 2016). For instance, by analysing data on resource usage and patron queries, library leaders can identify areas where staff may need additional support or training, ensuring that collaborative efforts are directed towards high-impact areas. BDA also enable leaders to make evidence-based decisions, which promotes transparency and accountability within teams (Chen, Chiang & Storey, 2012). Data-driven leadership often support inclusive and collaborative environment by providing all team members with access to shared information as well as align their efforts with institutional goals and foster a culture of continuous improvement.

Several forms of big data analytics are utilized by libraries to support decision-making, including predictive analytics, user behaviour analysis and workflow analytics. Sivarajah, Kamal, Irani and Weerakkody (2017) highlighted some forms of big data analytics for libraries to include descriptive analytics, diagnostic analytics, predictive analytics, prescriptive analytics, real-time (streaming) analytics, cognitive analytics, behavioural

analytics, social media analytics, customer analytics, risk analytics and financial analytics. Predictive analytics, for example, uses historical data to forecast future needs and trends, allowing library leaders to anticipate changes in user demands and adjust resources proactively. User behaviour analysis, enables libraries to monitor how patrons interact with resources and services, which can inform team collaboration and service strategies. While workflow analytics further enhances team collaboration and leadership by providing insights into staff productivity and process efficiency.

While the benefits of big data analytics in enhancing collaboration and leadership management in libraries are substantial, challenges persist. Many academic libraries, particularly in developing regions, face constraints such as limited budgets, technical skills shortages and data privacy concerns (Gantz & Reinsel, 2012). Moreover, issues such as data privacy, resource limitations, and resistance to change may hinder effective collaboration (Sivarajah, Kamal, Irani & Weerakkody, 2017). Leaders must address these challenges by fostering a supportive culture, providing training in data literacy and implementing data governance policies to protect user information.

Statement of the Problem

The advent of big data analytics (BDA) has presented university libraries with unprecedented opportunities for improving decision-making, collaboration, and team leadership management. However, many libraries, particularly those in resource-constrained environments like Benue State University Library in Makurdi, struggle to harness the full potential of BDA due to limited technological infrastructure, data skills gaps and a lack of strategic implementation frameworks. This has led to inefficiencies in resource allocation, low staff morale and challenges in meeting the evolving needs of their academic

communities. Moreover, while predictive, user behaviour and workflow analytics have shown promise in enhancing collaboration and leadership in other sectors, their specific application in university libraries remains underexplored. This study aims to close this gap by examining how these analytics tools can be effectively utilized in the library context to foster collaboration and improve team leadership, ultimately enabling university libraries to better serve their academic communities.

Research Questions

To facilitate this study, the following questions will be answered:

1. What is the influence of predictive analytics in enhancing collaboration and team leadership management in Benue State University Library, Makurdi?
2. What is the influence of user behaviour analytics in enhancing collaboration and team leadership management in Benue State University Library, Makurdi?
3. What is the influence of workflow analytics in enhancing collaboration and team leadership management in Benue State University Library, Makurdi?
4. What are the challenges encountered by library staff in leveraging big data analytics for enhanced collaboration and team leadership management in Benue State University Library, Makurdi?

Literature Review

Influence of Predictive Analytics in Enhancing Collaboration and Team Leadership Management in University Libraries

Predictive analytics is a form of analytics that uses statistical techniques, machine learning algorithms and data mining to analyse current and historical data to make predictions about future events or trends within library setting. Within the context of university libraries, predictive analytics can provide valuable insights into user demands, resource allocation, and

workflow efficiencies. Gandomi and Haider (2015) emphasize that predictive analytics enables organizations to anticipate needs and proactively manage resources, which is critical in environments like libraries, where seasonal patterns and academic cycles often influence resource demands. Meanwhile, by forecasting peak usage times, libraries can better prepare staff schedules, optimize resource availability and prevent service bottlenecks, thereby enhancing team collaboration and leadership effectiveness.

Through predictive analytics, libraries can analyse circulation records, digital access logs and other user interaction data to identify popular resources and adjust acquisition and staffing strategies accordingly. Chen, Chiang and Storey (2012) highlighted the role of predictive analytics in supporting data-driven leadership. The authors found that leaders who use predictive insights can make more informed decisions, improve accountability and transparency within teams. By using predictive models, library leaders can make informed decisions that ensure the availability of critical resources, ultimately supporting team efforts to meet user needs and improve service quality. It is known for its ability to improve decision-making and organizational alignment by identifying trends and forecasting future events based on historical data.

Influence of User Behaviour Analytics in Enhancing Collaboration and Team Leadership Management in University Libraries

User behaviour analytics focuses on analysing patterns in user interactions, preferences and resource usage. This type of analytics is essential for enhancing collaboration and team leadership management in libraries as it transforms data-driven insights into user needs and expectations. Marr (2018) affirmed that understanding user behaviour allows library leaders to make evidence-based decisions on resource allocation, programme development and service improvement. Moreover, user behaviour analytics fosters a user-

centred approach to leadership, where different teams work collaboratively to design and deliver services that align with the needs of the academic community. Behaviour analytics involves analysing patterns in search queries, loan transactions and digital resource usage which helps to identify areas where team interventions may be needed. Sivarajah et al. (2017) agree that user behaviour analytics enables leaders to customize services, prioritize high-demand resources and anticipate changing user needs. Analysing data on patron interactions, frequently used resources and peak usage times can help library leaders structure team efforts more effectively, promoting a collaborative environment where each team member understands the relevance of their work.

Behaviour analytics enhances collaboration and team leadership management in libraries by providing insights into staff interactions, work patterns and communication styles. This data-driven approach helps leaders identify strengths, improve tasks allocation, foster effective team work and develop training strategies that optimises team efficiency, engagement and overall performance within the library environment. User behaviour analytics can serve as a bridge between library departments, fostering communication and shared understanding among team members (Davenport, 2024). Thus, by sharing insights from user behaviour analytics across departments, libraries can enhance access to shared knowledge, improve teamwork and ensure that all staff members work towards common goals. This collaborative approach enhances leadership effectiveness as it promotes a culture of transparency and inclusivity. User behaviour analytics is the process of collecting and analysing datasets on how library users interact with systems, platforms or environment to understand patterns and trends in their actions.

Influence of Workflow Analytics in Enhancing Collaboration and Team Leadership Management in University Libraries

Workflow analytics examines data related to task completion, productivity, and resource allocation, is critical for enhancing collaboration and team leadership in university libraries. Provost and Fawcett (2013) argue that workflow analytics enables leaders to identify bottlenecks, streamline processes, and optimize team performance, ultimately improving service delivery. Libraries using workflow analytics can make data-driven adjustments to staff assignments and workflows, leading to increased productivity and enhanced collaboration across teams.

Workflow analytics insights help library leaders to coordinate teams and address high-demand areas effectively. It fosters collaboration across departments to ensure comprehensive service coverage. Northouse (2018) examined the role of workflow analytics in promoting effective team leadership. The author found that leaders who use data to track team performance are better equipped to make informed-decisions, hold team members accountable and foster a culture of continuous improvement. Similarly, Gandomi and Haider (2015) emphasized the importance of workflow analytics in resource-limited environments, arguing that data-driven insights can help library leaders make the most of limited resources by identifying high-impact areas for improvement. They found that by focusing on efficiency and performance, workflow analytics enables leaders to foster a collaborative and high-performing team even when resources are constrained. Meanwhile, this finding underscores significant influence of workflow analytics on collaboration as data-driven insights allow leaders to address inefficiencies, redistribute workloads and ensure that team efforts are aligned with organizational objectives. Workflow analytics is therefore the process of collecting, measuring and analysing data related to workflows within a library to understand how processes are functioning.

Challenges of Leveraging Big Data Analytics for Enhanced Collaboration and Team Leadership Management in University Libraries

Implementing big data analytics (BDA) in university libraries presents several challenges, especially in contexts where resources, skills, and infrastructure are limited. Despite the transformative potential of BDA to improve collaboration and team leadership, obstacles in data management, technological limitations, and organizational culture often hinder its effectiveness. One of the primary challenges in implementing BDA in university libraries is ensuring data privacy and security, especially when handling sensitive patron data. According to Sivarajah et al. (2017), the risks associated with data breaches or misuse of user information can create resistance to data-driven approaches among both staff and patrons. Libraries must comply with data protection regulations and maintain trust among users, yet these requirements can limit the scope and depth of analytics that libraries can employ.

Another significant barrier is the shortage of skilled personnel and data literacy within university libraries. Libraries may lack staff with the expertise to analyse complex data sets or interpret analytics results in ways that are meaningful for decision-making. Chen, Chiang and Storey (2012) emphasize that successful BDA adoption requires both technical knowledge and analytical skills, which many library staff may not possess. This skills gap limits the potential of BDA to enhance team leadership and collaboration, as decision-makers struggle to translate data insights into actionable strategies. Furthermore, Gandomi and Haider (2015) note that the limited availability of data professionals in libraries creates a dependency on external consultants or training programmes, which can strain budgets and slow the analytics implementation process. Northouse (2018) and Provost and Fawcett (2013) identified resistance to change and that the cost of implementing and maintaining BDA systems poses a substantial challenge for many libraries. Technological constraints such as outdated hardware, limited software options and inadequate data storage, also pose

challenges for BDA implementation. University libraries, particularly in developing regions often operate under tight budgets, making it difficult to invest in modern analytics platforms and tools.

Methodologies

The study adopted a descriptive survey design. The population of the study comprised of 87 staff of Benue State University Library, Makurdi. Given a sizeable population, purposive sampling techniques was employed to consider the entire number of 87 library staff. A self-designed, closed ended questionnaire titled “Influence of Big Data Analytics in Enhancing Collaboration and Team Leadership Management” was used to collect data from respondents. The questionnaire was structured on a 4-point modified likert scale with response options: Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1). Data collected were analysed using descriptive statistics such as frequency counts and mean. Any item in with a mean score of 2.5 and above were considered “Agree”, while those below 2.5 were considered “Disagree”.

Results

Table 1: Response Rate

Item Description	Frequency (N)	Percentage (%)
Questionnaire Retrieved	80	92
Questionnaire Lost	7	8
Total	87	100

Source: Survey Data, 2024

Data presented in table 1 revealed that, 87(100%) questionnaires were administered for the study. However, only 80(92%) were retrieved and found usable, while 7(8%) were either lost or wasted.

S/N	Statement	N	\bar{X}	Decision
-----	-----------	---	-----------	----------

1	Predictive analytics helps our library anticipate user needs and adjust resources accordingly	80	3.33	Agree
2	Our library leadership relies on predictive analytics to align team efforts with expected service demands	80	3.27	Agree
3	Using predictive analytics has improved communication and coordination among library staff	80	3.41	Agree
4	Predictive analytics has enhanced our team’s ability to proactively manage high-demand periods	80	3.15	Agree
5	Predictive analytics has supported effective decision-making by library leadership in resource allocation	80	3.37	Agree
Cluster Mean		80	3.31	Agree

Table 2: Mean Rating on Influence of Predictive Analytics in Enhancing Collaboration and Team Leadership Management

Source: Survey Data, 2024

Data presented in table 2 shows that respondents agreed that predictive analytics helps their library anticipate user needs and adjust resources accordingly ($\bar{X} = 3.33$), their library leadership relies on predictive analytics to align team efforts with expected service demands ($\bar{X} = 3.27$), using predictive analytics has improved communication and coordination among library staff ($\bar{X} = 3.41$), predictive analytics has enhanced their team’s ability to proactively manage high-demand periods ($\bar{X} = 3.15$), predictive analytics has supported effective decision-making by library leadership in resource allocation ($\bar{X} = 3.37$) respectively. Having a cluster mean of 3.31 above the criterion men further underscored the influence of predictive analytics in enhancing effective collaboration and team leadership management in Benue State University Library, Makurdi. This finding collaborates with Gandomi and Haider (2015) who revealed that predictive analytics enables organizations to anticipate needs and proactively manage resources, which is critical in environments like libraries, where seasonal patterns and academic cycles often influence resource demands.

S/N	Statement	N	\bar{X}	Decision
1	User behaviour analytics helps us understand patrons’	80	2.83	Agree

	needs and improve our services accordingly			
2	Insights from user behaviour analytics foster collaboration among library departments to meet user expectations	80	3.08	Agree
3	Library leadership uses user behaviour data to create more effective and user-centred team goals	80	2.94	Agree
4	Analysing user behaviour patterns has improved teamwork and cooperation among library staff	80	3.10	Agree
5	Our library leaders use user behaviour analytics to prioritize resources and services effectively	80	2.77	Agree
	Cluster Mean	80	2.95	Agree

Table 3: Mean Rating on Influence of User Behaviour Analytics in Enhancing Collaboration and Team Leadership Management

Source: Survey Data, 2024

Data in table 3 revealed that respondents agreed that user behaviour analytics helps them understand patrons’ needs and improve our services accordingly (\bar{X} = 2.83), insights from user behaviour analytics foster collaboration among library departments to meet user expectations (\bar{X} = 3.08), library leadership uses user behaviour data to create more effective and user-centred team goals (\bar{X} = 2.94), analysing user behaviour patterns has improved teamwork and cooperation among library staff (\bar{X} = 3.10), and their library leaders use user behaviour analytics to prioritize resources and services effectively (\bar{X} = 2.83) respectively.

S/N	Statement	N	\bar{X}	Decision
1	Workflow analytics allows us to identify areas for improvement in our daily operations	80	3.48	Agree
2	Our library uses workflow data to optimize team productivity and streamline task completion	80	3.36	Agree
3	Leadership relies on workflow analytics to ensure effective collaboration within the library team	80	3.44	Agree
4	Workflow analytics enables better resource distribution and workload management among library staff	80	3.25	Agree
5	Workflow data analysis has improved our team’s efficiency and cohesion	80	3.40	Agree
	Cluster Mean	80	3.39	Agree

The cluster mean is 2.94 above the criterion mean of 2.5, indicating significant influence of behaviour analytics in enhancing collaboration and team leadership management inBSU

library. This finding aligns with Davenport (2024) who advanced that user behaviour analytics can serve as a bridge between library departments, fostering communication and shared understanding among team members.

Table 4: Mean Rating on Influence of WorkflowAnalytics in Enhancing Collaboration and Team Leadership Management
Source: Survey Data, 2024

Data presented in table 4 revealed that respondents agreed that workflow analytics allows them to identify areas for improvement in our daily operations ($\bar{X} = 3.48$), their library uses workflow data to optimize team productivity and streamline task completion ($\bar{X} = 3.36$), leadership relies on workflow analytics to ensure effective collaboration within the library team ($\bar{X} = 3.44$), workflow analytics enables better resource distribution and workload management among library staff($\bar{X} = 3.25$), and workflow data analysis has improved their team’s efficiency and cohesion($\bar{X} = 3.40$) respectively. All the items in the table scored above the criterion mean of 2.5 for agree, with a cluster mean of 3.39 which implies that workflow analytics have significant influence in enhancing collaboration and team leadership management in Benue State University Library, Makurdi. This finding is in line with Provost and Fawcett (2013) who found that workflow analytics enables leaders to identify bottlenecks, streamline processes and optimize team performance, ultimately improving service delivery.

S/N	Statement	N	\bar{X}	Decision
1	Limited technical infrastructure hinders our library's ability to implement big data analytics	80	3.17	Agree
2	Privacy concerns prevent us from fully utilizing data analytics to improve collaboration	80	3.30	Agree
3	Lack of data analytics skills among staff members affects	80	3.47	Agree

	the effectiveness of our data-driven initiatives			
4	Financial constraints limit our library’s access to advanced data analytics tools and training	80	3.00	Agree
5	Organizational resistance to new data-driven methods is a barrier to improving team leadership	80	2.68	Agree
	Cluster Mean	80	3.12	Agree

Table 5: Mean Rating on Challenges of Leveraging Big Data Analytics for Enhanced Collaboration and Team Leadership Management

Source: Survey Data, 2024

Data presented in table 5 indicates that respondents agreed that limited technical infrastructure hinders their library's ability to implement big data analytics ($\bar{X} = 3.17$), privacy concerns prevent them from fully utilizing data analytics to improve collaboration ($\bar{X} = 3.30$), lack of data analytics skills among staff members affects the effectiveness of our data-driven initiatives ($\bar{X} = 3.47$), financial constraints limit their library’s access to advanced data analytics tools and training ($\bar{X} = 3.00$), and organizational resistance to new data-driven methods is a barrier to improving team leadership ($\bar{X} = 2.68$) respectively. It is evident that all the items listed in the table have mean score above the criterion mean of 2.5 with a cluster mean of 3.12 indicating that all the items are challenges library staff in Benue State University Library encounter in leveraging big data analytics in enhancing collaboration and team leadership management. This finding is in tandem with Sivarajah, Kamal, Irani and Weerakkody(2017) who also found that limited access to advanced analytics infrastructure restricts the types of data libraries can collect and analyse, thus impacting their ability to leverage insights for leadership and collaboration enhancement.

Recommendations

Based on the findings and conclusions of the study, the following recommendation were proffered:

1. The library should invest in more robust predictive analytics tools and training to enable leadership and staff to anticipate user needs accurately. By providing targeted training and resources, the library can enhance proactive planning, improve service delivery and optimize resource allocation in ways that support both team leadership and collaboration.
2. To better understand and meet user needs, the library should expand its use of user behaviour analytics. By focusing on data that reveals user preferences and trends, the library can create user-centred goals that unify team efforts.
3. The library should prioritize workflow analytics to streamline internal operations and improve task management. By monitoring and analysing workflow data, library leaders can make data-driven adjustments that enhance team productivity and efficiency.
4. The university library should invest in upgrading its technical infrastructure, including high-performance computing systems and storage solutions, to support the effective use of big data analytics tools.
5. Library management should establish robust data governance policies to address privacy concerns, ensuring that all data handling complies with privacy regulations and promotes transparency.
6. It is crucial to offer ongoing training and professional development programs to enhance staff skills in data analysis and big data tools, empowering them to fully leverage analytics in decision-making.
7. The university should explore external funding opportunities, grants, or partnerships to overcome financial constraints, ensuring that resources are available for advanced analytics software and training.

8. Leadership should implement change management strategies to foster a culture of data-driven decision-making, addressing resistance to new technologies and encouraging staff buy-in for adopting big data analytics practices.

Conclusion

Based on the findings of this study it can be concluded that big data analytics has significant positive influence on enhancing collaboration and team leadership management in Benue State University Library, Makurdi. Specifically, predictive analytics, user behaviour analytics and workflow analytics have shown a measurable impact in optimizing resource allocation, improving communication and fostering team cohesion. Each of these analytics types contributes uniquely to collaboration and leadership, as they allow library staff and leaders to anticipate demand, prioritize user-centred goals and streamline operations. However, the study also concludes that several challenges impede the library in leveraging big data analytics including limited technical infrastructure, privacy concerns, shortage of skilled personnel, financial constraints and organizational resistance as key barriers. These challenges restrict the library's capacity to fully utilize BDA for enhancing collaboration and leadership.

References

- Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R. & Childe, S. J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *International Journal of Production Economics*, 182(2), 113-131.
- Baker, D. (2017). Libraries and the challenge of digital libraries. In M.M. Feehan & D.S. Johnson (Eds.), *Big data and academic libraries* (pp. 93-112). Oxford: Chandos Publishing.
- Chen, H., Chiang, R. H. L. & Storey, V.C. (2012). Business intelligence and analytics: From big data to big impact. *Management Information Systems Quarterly*, 36(4), 1165-1188.

- Davenport, T. H. (2024). Next generation big data analytics in Malaysian libraries: State of the art, challenges and prospects. *Malaysian Journal of Library and Information Science*, 3(1), 16-33.
- De Mauro, A., Greco, M. & Grimaldi, M. (2015). What is big data? A consensual definition and a review of key research topics. *AIP Conference Proceedings*, 1644(1), 97-104. <https://doi.org/10.1063/1.4907823>
- Gandomi, A. & Haider, M. (2015). Beyond the hype: Big data concepts, methods and analytics. *International Journal of Information Management*, 35(2), 137-144.
- Gantz, J. & Reinsel, D. (2012). The digital universe in 2020: Big data, bigger digital shadows, and biggest growth in the Far East. IDC iView. Retrieved from <https://www.emc.com/leadership/digital-universe/2020-universe.htm>
- Marr, B. (2018). *Big data in practice: How 45 successful companies used big data analytics to deliver extraordinary results*. New Jersey: Wiley.
- Northouse, P. G. (2018). *Leadership: Theory and practice* (8th ed.). Melbourn: Sage Publications.
- Provost, F. & Fawcett, T. (2013). *Data science for business: What you need to know about data mining and data-analytic thinking*. Sebastopol: O'Reilly Media.
- Sivarajah, U., Kamal, M. M., Irani, Z. & Weerakkody, V. (2017). Critical analysis of big data challenges and analytical methods. *Journal of Business Research*, 70, 263-286.